



4" of snow blankets a neighborhood near Ann Road and Clark County 215 in northwest Las Vegas.

The Mojave Desert and Southern Great Basin Low Elevation Snow Event of December 14th-16th, 2008

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After one of the warmest autumns on record in the Mojave Desert and southern Great Basin, a drastic shift in the upper air pattern finally occurred in mid-December 2008. The result of this was a deep, upper-level trough axis that was situated across the western United States and set the stage for an unusual low elevation snow event in the Mojave Desert and southern Great Basin from the late evening hours of December 14th into the very early morning hours of December 16th.

Synoptic Overview

A significant shift in the jet stream across the southwestern United States began to take place on Friday, December 12th as a storm system moved out of the Pacific Northwest and began to drop a cold front southeastward across Nevada on the morning of Saturday, December 13th. This front passed across the Mojave Desert during the evening hours of December 13th producing wind gusts in excess of 40 mph for several hours. Temperatures dropped sharply behind the front with readings reaching their coldest levels of the season on the morning of Sunday, December 14th. In

addition this system ushered in significantly colder air, it also resulted in a drying of the air mass as dewpoints dropped into the single digits and teens on December 14th, with subzero dewpoints briefly observed at Bishop.

A deep upper level trough axis remained across the western United States by the nighttime hours of December 14th with a 120 knot jetstream directly across the Mojave Desert (Figure 1). Upper level vorticity (energy) embedded in the flow aloft ahead of an upper-level low off the Oregon coast moved towards southern California by that night producing precipitation as it tapped into a plume of moisture with Precipitable Water values between 0.30 and 0.50 of an inch. This band of deeper moisture worked into the Mojave Desert and southern Great Basin during the night of December 14th. Initially due to the dry air mass that was in place, the moisture that spread into the region had to saturate the atmosphere before precipitation could begin to fall.

Most of the precipitation that fell across the area occurred in about a 3 to 6 hour window just ahead a 500 mb shortwave trough axis and maximum area of PVA (Figure 2). This was well represented in infrared satellite images which showed an area of enhanced clouds moving across southern Nevada and southeastern California on the morning of December 15th (Figure 3). The energy moving ahead of the upper-level low was associated with warm air advection as evidenced by the wind fields in the Desert Rock sounding veering with height (Figures 4 and 5).

As precipitation began snow levels were generally around 3000 feet across the area. The Desert Rock sounding showed 700 mb temperatures of -11C across the area, which had been typically correlated to snow levels around this value. The sounding also showed dry low-levels and a wet bulb zero height of 3303 feet, which is almost near the surface for this station. Evaporational cooling of the atmosphere helped it to become fully saturated and also resulted in precipitation eventually becoming all snow or mixing with snow in many of the lower elevations. Snow was observed mixed with rain where wet bulb zero values were around 33F/34F and all snow where wet bulb zero values were 32F or lower.

Later in the day as warmer air began to advect into the area, snow levels gradually rose to around 4000-4500 feet and precipitation began to change back to all rain or a mix of rain and snow. The system finally moved off to the east by the late night hours of the 15th, although some areas in Mohave County, Arizona did not see precipitation end until early on the 16th.

Observations

Areas that saw the greatest snow had one or more of a combination of factors that resulted in this, such as orographic lift, time of day (snow falling at night or in the morning when the sun angle is lower), and/or strong upward vertical motion. The heaviest snowfall reports were in the Spring Mountains of Clark County where over 20 inches of snow fell above 7600 feet. The northern portions of Lincoln and Esmeralda County saw no precipitation at all from this event as the main axis of the jet stream and the embedded disturbances within it tracked well to the south.

In the Las Vegas Valley, measurable snow fell down to about 2600-2800 feet along the west side of the valley with between 2 and 5 inches measured in this area. Areas around 2500 feet along the north and west side of the valley saw a mix of rain and snow with periods of all snow but did not see any notable accumulations. In the lower elevations of the Valley, only rain was observed on the east side and in Henderson, while areas along Interstate 15 such as The Strip saw mainly rain with periods of wet snow flakes mixing in with the rain. At McCarran International Airport, this was the first time snow was observed since December 22, 2006.

Conclusion

Overall, this was generally a well-forecasted event by the staff at the National Weather Service in Las Vegas. Forecasts and other products had snow levels reaching as low as 2500-3000 feet for this event nearly 7 days out. As the event drew closer and confidence improved, additional

products were issued highlighting the potential for low elevation snow followed by winter weather watches, advisories and warnings.

Acknowledgments

I would like to thank the staff members who provided comments on and made resources available so I could compile this report.

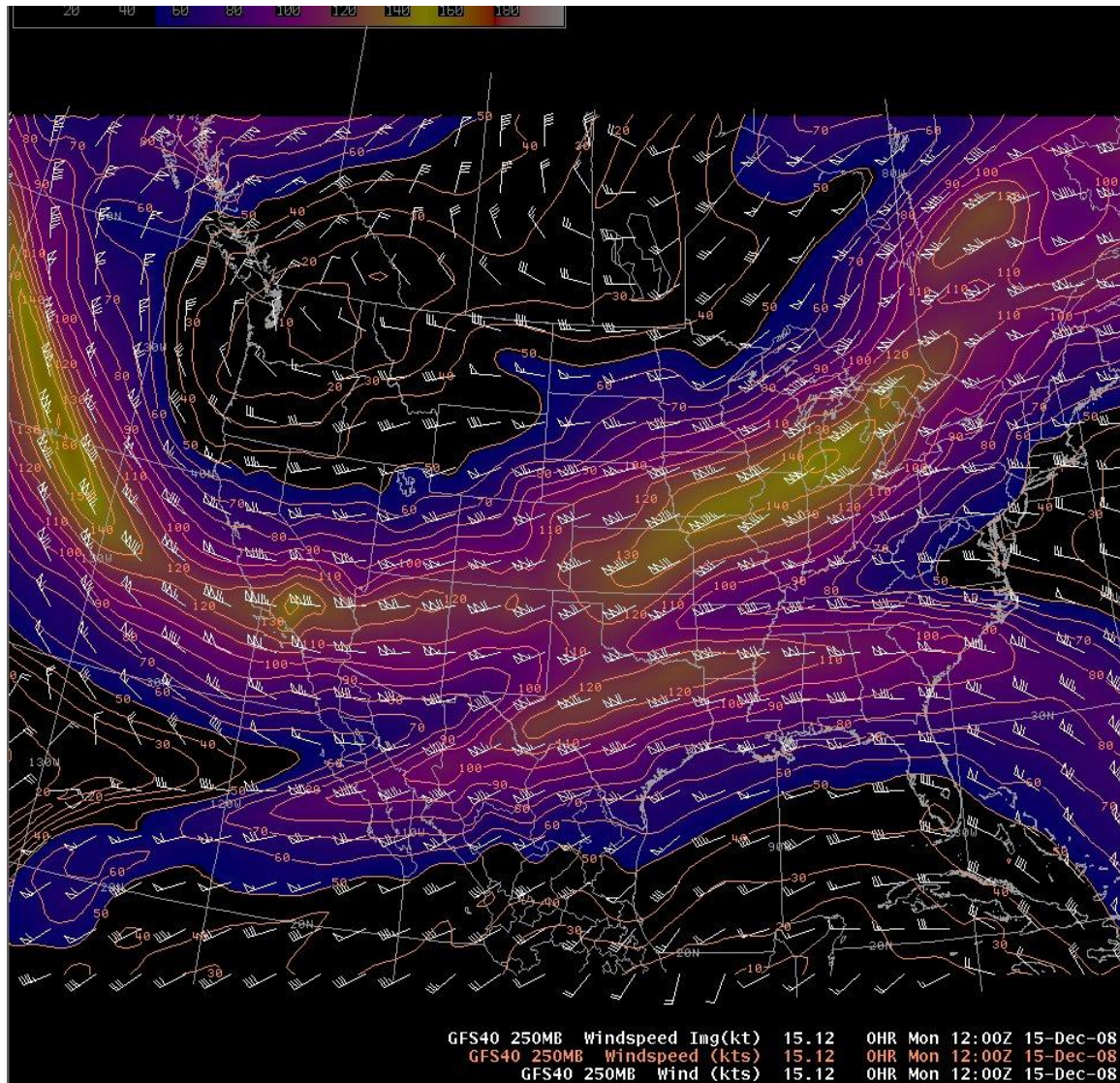


Figure 1 – 250 mb winds initialized at 12z on December 15th from the GFS.

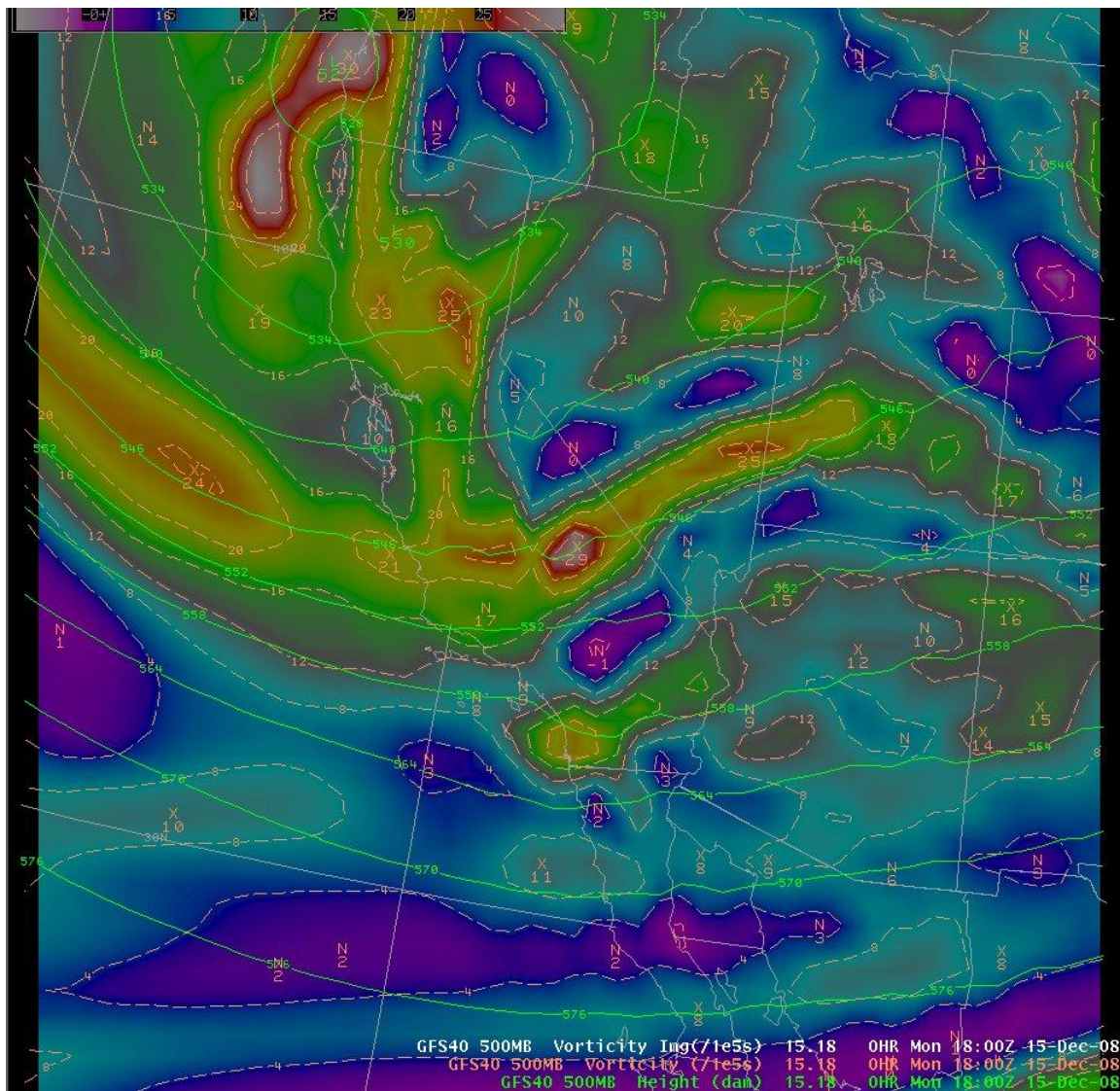


Figure 2 – GFS initialized 500 mb heights and vorticity at 18z on December 15th.

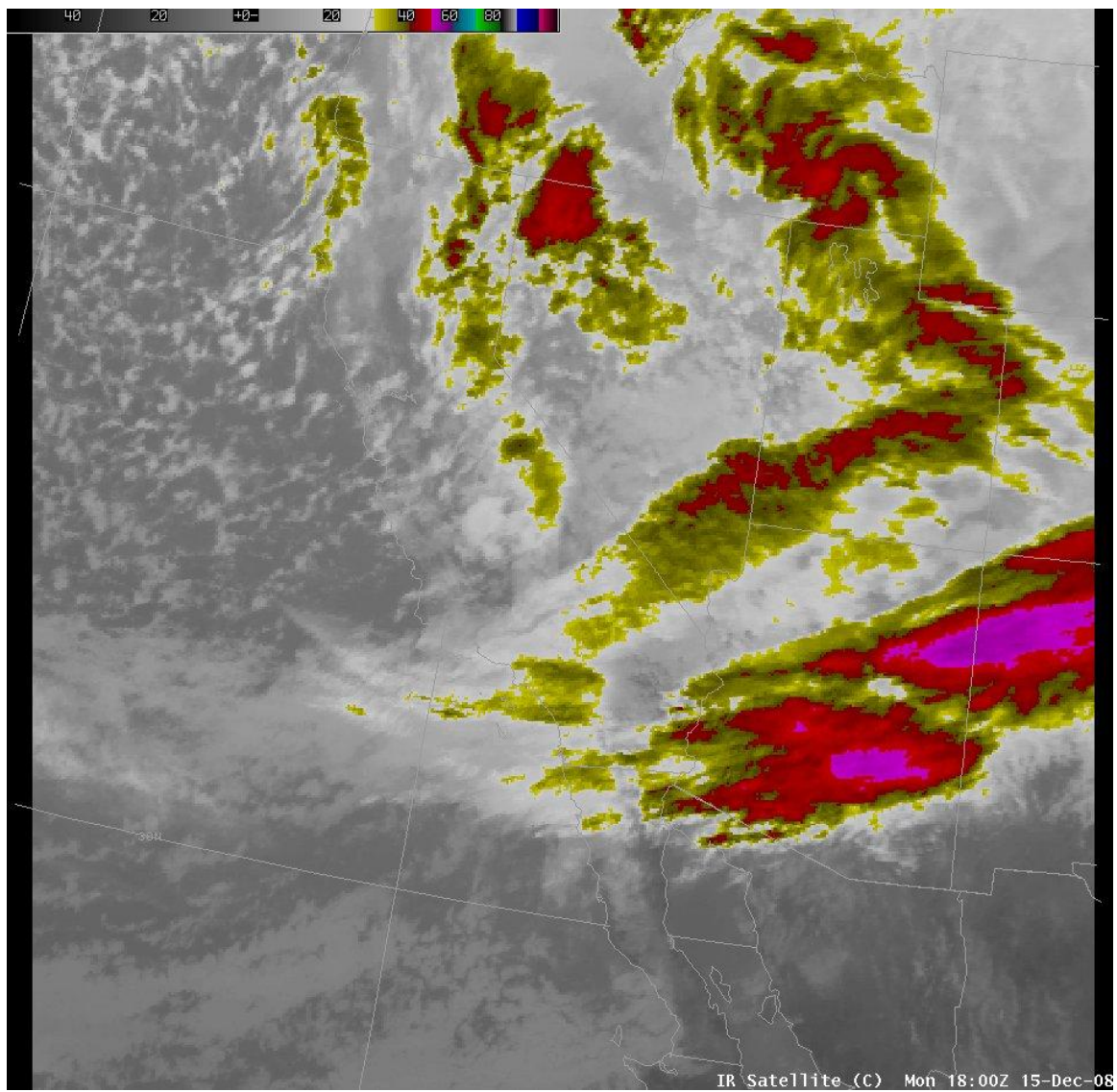


Figure 3 – Infrared satellite image at 18z on December 15th. Note the band of clouds across southern Nevada and interior southeast California associated with the precipitation.

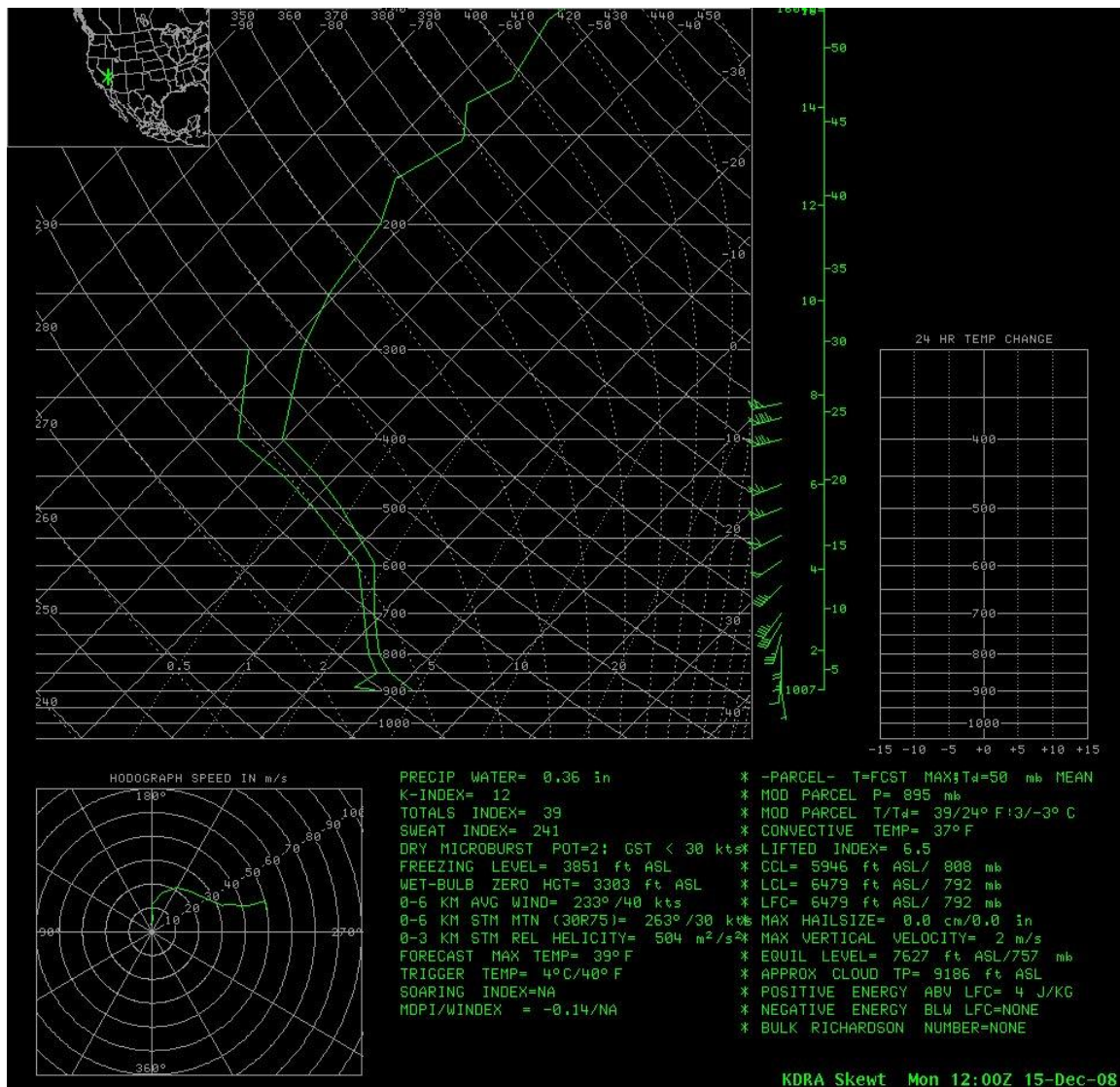


Figure 4 – 12z December 15th KDRA sounding.

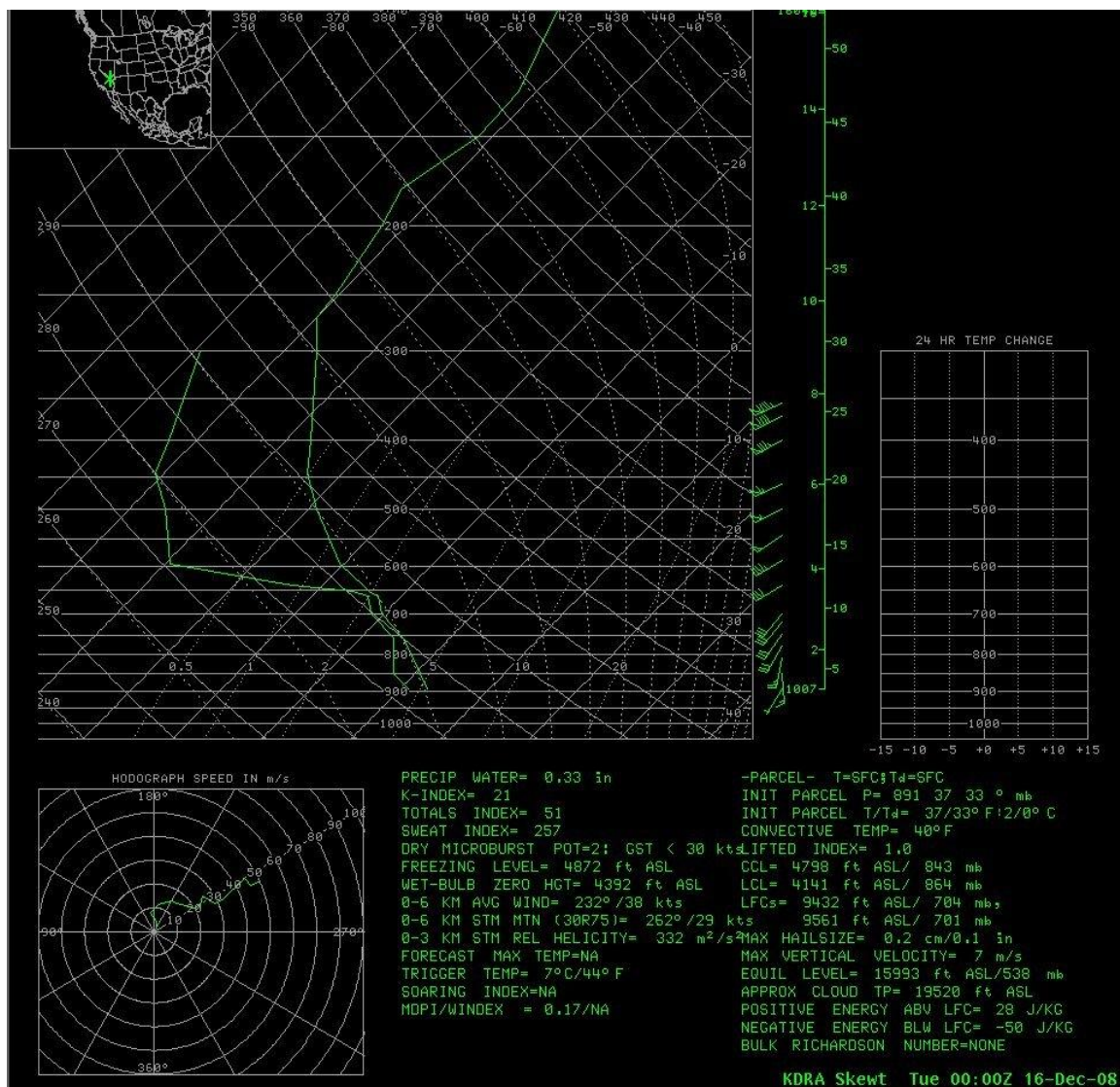
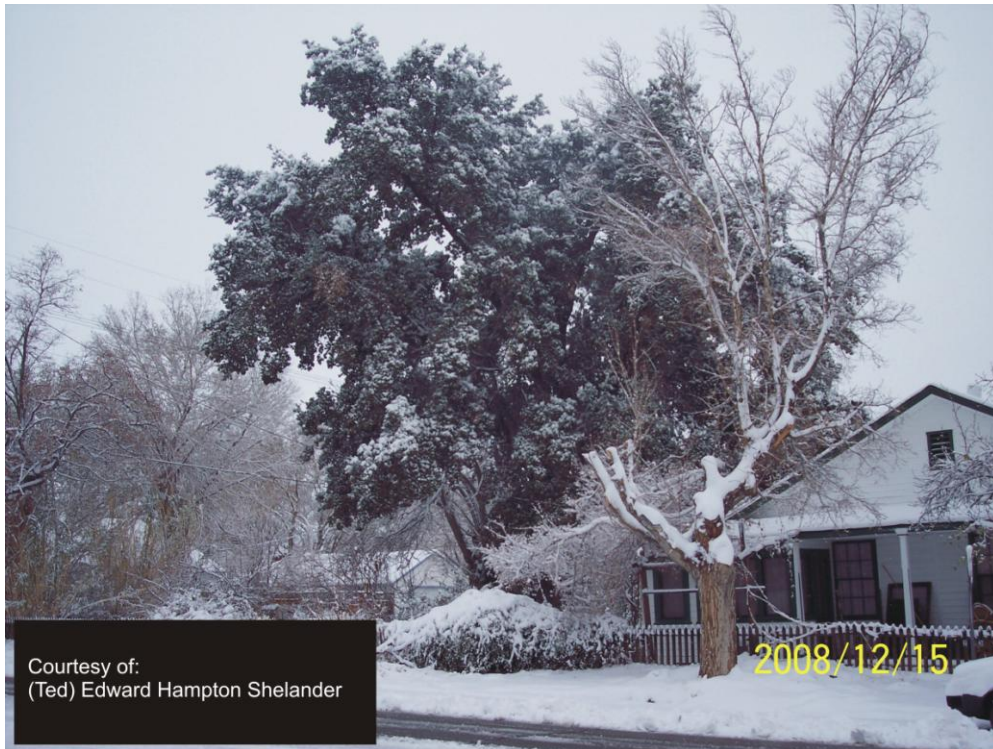


Figure 5 – 00z December 16th KDRA sounding.



Photos of snow in Independence, CA where 8 to 12 inches was reported.



Courtesy of:
(Ted) Edward Hampton Shelander

2008/12/15



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(Ted) Edward Hampton Shelander

Photos of snow in Independence, CA.



Photos of snow in the Centennial Hills area of Las Vegas taken shortly after 11 AM on December 15th.



Photos of snow in the Centennial Hills area of Las Vegas.



Photos taken along Clark County 215 between Ann Road and Hualapai Drive around 11:30 AM on December 15th. Nearly 2 inches of snow was on the ground around 2800 feet in elevation.



Photos taken near Ann Road and Clark County 215 shortly before noon on December 15th.